



Association Between Regular Postpartum Breastfeeding Counseling and Maternal-infant Bonding: Second-month Postpartum Outcomes

Düzenli Postpartum Emzirme Danışmanlığı ile Anne-bebek Bağlanması Arasındaki İlişki: Postpartum İkinci Ay Sonuçları

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ABSTRACT

Objective: Maternal-infant bonding is central to postpartum psychological adaptation, and breastfeeding-related difficulties may adversely affect maternal emotional well-being and bonding. This study investigated the association between regular postpartum breastfeeding counseling and maternal-infant bonding during the second postpartum month.

Methods: In this single-center analytical observational study, 103 postpartum women were evaluated at 60 ± 7 days after delivery and grouped according to whether they received regular breastfeeding counseling during the first postpartum week. Maternal-infant bonding was assessed with the validated Turkish version of the Mother-to-infant bonding scale (MIBS). Groups were compared using Student's t-test and the chi-square test, and multivariable linear regression evaluated the independent association between regular counseling and total MIBS scores.

Results: Overall, 44 (42.7%) participants received regular counseling and 59 (57.3%) did not. Those who received counseling had significantly lower total MIBS scores (2.30 ± 2.15 vs. 6.39 ± 2.43; p < 0.001), with significant differences also across several exploratory item scores (all p < 0.01). In multivariable regression, regular counseling remained independently associated with lower total MIBS scores [β = -4.51, 95% confidence interval (CI): -5.43 to -3.58; p < 0.001], as did employment status (β = 1.30, 95% CI: 0.29-2.32; p = 0.012).

Conclusion: Regular postpartum breastfeeding counseling was associated with more favorable maternal-infant bonding during

ÖZ

Amaç: Anne-bebek bağlanması, postpartum dönemde psikolojik uyumun temel unsurlarından biridir. Emzirme ile ilişkili güçlükler, annenin duygusal iyilik halini ve anne-bebek bağlanmasını olumsuz etkileyebilir. Bu çalışmada, düzenli postpartum emzirme danışmanlığı ile postpartum ikinci ayda anne-bebek bağlanması arasındaki ilişki araştırılmıştır.

Yöntemler: Tek merkezli, analitik ve gözlemsel nitelikteki bu çalışmada, doğum sonrası 60 ± 7. günde 103 kadın değerlendirilmiş ve postpartum ilk hafta boyunca düzenli emzirme danışmanlığı alıp almamalarına göre gruplandırılmıştır. Anne-bebek bağlanması, anne-bebek bağlanma ölçeğinin (MIBS) geçerliliği doğrulanmış Türkçe versiyonu kullanılarak değerlendirilmiştir. Gruplar Student's t-testi ve ki-kare testi ile karşılaştırılmış; düzenli danışmanlık ile toplam MIBS puanları arasındaki bağımsız ilişki çok değişkenli doğrusal regresyon analiziyle incelenmiştir.

Bulgular: Katılımcıların 44'ü (%42,7) düzenli emzirme danışmanlığı alırken, 59'u (%57,3) almamıştır. Danışmanlık alan grupta toplam MIBS puanları anlamlı düzeyde daha düşük bulunmuştur (2,30 ± 2,15'e karşı 6,39 ± 2,43; p < 0,001). Keşifsel olarak değerlendirilen bazı ölçek maddelerinin puanlarında da anlamlı farklılıklar saptanmıştır (tümünde p<0,01). Çok değişkenli regresyon analizinde, düzenli emzirme danışmanlığı daha düşük toplam MIBS puanlarıyla bağımsız olarak ilişkili bulunmuştur [β = -4,51; %95 güven aralığı (GA): -5,43 ile -3,58; p < 0,001]. Benzer şekilde, çalışma durumu da toplam MIBS puanlarıyla bağımsız olarak ilişkili bulunmuştur (β = 1,30; %95 GA: 0,29-2,32; p = 0,012).

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ABSTRACT

the second postpartum month. Given the observational design, this represents an association rather than a causal relationship, and randomized prospective studies are warranted to confirm it.

Keywords: Maternal-infant bonding, breastfeeding counseling, postpartum period, mother-to-infant bonding scale, maternal psychological adaptation

INTRODUCTION

Maternal-infant bonding is a dynamic process that describes the emotional connection developed by a mother toward her infant. This bond begins during the prenatal period and continues throughout the child's life (1). A strong maternal-infant bond constitutes the foundation of the child's social, emotional, and cognitive development, facilitates maternal adaptation to the motherhood role, and contributes to the development of parenting skills (1,2). Positive bonding has also been shown to positively influence children's social skills during the preschool period (2). In contrast, impaired bonding has been associated with psychosocial problems, weakened parent-child relationships, and an increased risk of depression and anxiety later in life (3).

Maternal-infant bonding may be influenced by several biological, psychological, and social factors. Unplanned pregnancy, high parity, lack of social support, maternal stress, and postpartum depression have all been reported to negatively affect bonding levels (4-6). In addition, the childbirth process, postpartum pain severity, and maternal satisfaction with the birth experience may play important roles in postpartum psychological adjustment (7,8). Breastfeeding is considered one of the earliest and strongest forms of interaction between the mother and infant. However, difficulties experienced during breastfeeding may lead to stress, anxiety, and feelings of inadequacy in mothers, and mothers experiencing breastfeeding difficulties have been reported to exhibit lower bonding scores (3). Postpartum depression is also recognized as a major factor adversely affecting maternal-infant bonding (4-6).

Regular breastfeeding counseling may be associated with more positive maternal-infant bonding during the postpartum period by improving mothers' breastfeeding skills and self-confidence. Previous studies have demonstrated the beneficial effects of professional support and counseling on the childbirth experience (9). However, the number of studies investigating the association between regular breastfeeding counseling and maternal-infant bonding remains limited. To our knowledge, few studies have specifically evaluated this association using a validated maternal-infant bonding instrument in a routine postpartum care setting. Therefore, the present study aimed to compare maternal-infant bonding levels between mothers who received regular breastfeeding counseling during the postpartum period and those who did not.

MATERIALS AND METHODS

This single-center, analytical, observational study was conducted at the Zahide Küçük Gynecology and Obstetrics Clinic. Women

Öz

Sonuç: Düzenli postpartum emzirme danışmanlığı, postpartum ikinci ayda daha olumlu anne-bebek bağlanmasıyla ilişkili bulunmuştur. Çalışmanın gözlemsel tasarımı nedeniyle bu bulgu nedensel bir ilişkiden ziyade bir ilişkiyi göstermektedir. Bulguların doğrulanması için randomize prospektif çalışmalara ihtiyaç vardır.

Anahtar Sözcükler: Anne-bebek bağlanması, emzirme danışmanlığı, postpartum dönem, anne-bebek bağlanma ölçeği, maternal psikolojik uyum

receiving antenatal care at our institution who were eligible for follow-up were consecutively considered for enrollment. A total of 127 eligible pregnant women were initially enrolled. Twenty-four women were excluded from the final analysis: 8 delivered at another hospital because of relocation or other personal reasons, and 16 were excluded because of a history of stillbirth or neonatal death, a major congenital anomaly in the newborn, prolonged neonatal intensive care unit hospitalization (e.g., >7 days), severe maternal postpartum complications requiring intensive care, psychiatric illness, or diagnosed postpartum depression. Consequently, 103 postpartum women completed the study and were included in the final analysis (Figure 1).

All psychometric assessments were performed at a single time point during the second postpartum month. Following written informed consent, sociodemographic characteristics including maternal age, educational status, employment status, marital status, perceived income level, and smoking status were recorded. Obstetric and neonatal variables included parity, whether the pregnancy was planned, gestational age, mode of delivery, presence of episiotomy/perineal trauma, birth weight, infant sex, postpartum complications, and neonatal hospitalization history.

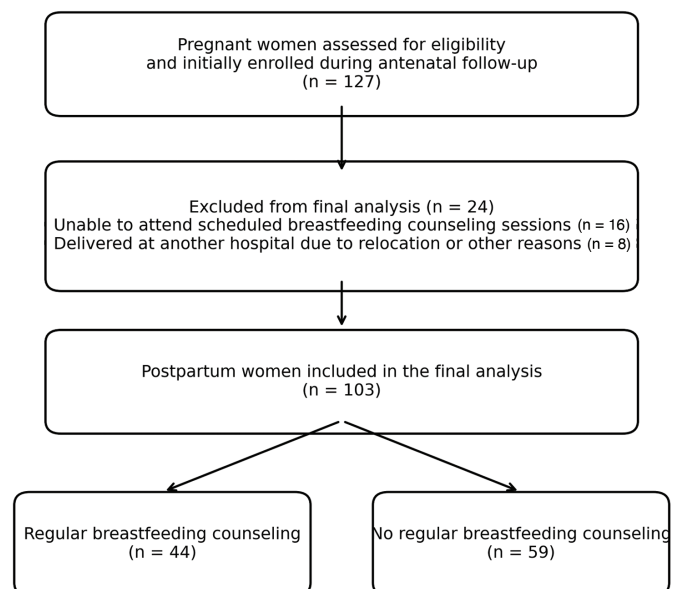


Figure 1. Participant flow diagram.

Maternal-infant bonding was assessed using the Turkish version of the mother-to-infant bonding scale (MIBS). The MIBS is an eight-item self-report questionnaire scored on a four-point Likert scale, with a total score range of 0-24 (10). The Turkish adaptation and psychometric validation of the scale were previously performed by Aydemir and Alparslan (11), demonstrating acceptable validity and reliability for assessing maternal-infant bonding in Turkish mothers. Lower total MIBS scores indicate more favorable maternal-infant bonding. In addition to the total MIBS score, individual MIBS item scores were evaluated descriptively.

Regular breastfeeding counseling consisted of a standardized postpartum breastfeeding education and support program delivered face-to-face by the same experienced breastfeeding nurse. Counseling was provided in three scheduled sessions during the first postpartum week, each lasting approximately 20 minutes. The educational content was standardized and included appropriate breastfeeding positioning, correct infant latch and holding techniques, breast care, prevention and management of common breastfeeding problems, and individualized responses to maternal questions and breastfeeding-related concerns.

Women aged 18 years or older who were able to read and understand Turkish, had undergone singleton live vaginal delivery, were within postpartum days 53-67 at the time of assessment, and provided written informed consent were included in the study. Women with a history of stillbirth or neonatal death, major congenital anomalies in the newborn, prolonged neonatal intensive care unit hospitalization (e.g., >7 days), severe maternal postpartum complications requiring intensive care, psychiatric illness, or diagnosed postpartum depression were excluded. Women with documented postpartum depression based on medical records or clinical psychiatric evaluation were excluded; however, no standardized screening instrument such as the Edinburgh postnatal depression scale was administered as part of the study protocol. In addition, women with active psychotic disorder, bipolar disorder, cognitive impairment interfering with reliable questionnaire completion, inability to establish effective communication, or refusal to complete the questionnaires were also excluded. All participant data were anonymized prior to analysis. No identifiable personal information was included in the study database, and all data were securely stored with access restricted exclusively to the research team.

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics version 17.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean $\pm$ standard deviation, whereas categorical variables were presented as numbers and percentages. The distribution of continuous variables was assessed before analysis using visual inspection and normality testing. Comparisons between groups were performed using Student's t-test for continuous variables and the chi-square test for categorical variables, as appropriate. A multivariable linear regression model was constructed to evaluate the independent association between regular breastfeeding counseling and total MIBS score. Variables considered clinically relevant or showing significant between-group differences were included in the multivariable model. Regression model assumptions, including multicollinearity, residual distribution, linearity, and homoscedasticity, were evaluated. Analyses of individual MIBS items

were considered exploratory; therefore, no formal adjustment for multiple comparisons was applied, and these findings should be interpreted cautiously. A post-hoc power analysis was performed using G*Power version 3.1.9.7 (Heinrich Heine University, Düsseldorf, Germany) for the primary outcome, namely the difference in total MIBS scores between the counseling and non-counseling groups. Based on the observed effect size (Cohen's $d = 1.78$), the final group sizes (44 and 59 participants), and a two-sided significance level of 0.05, the achieved statistical power exceeded 99.9%. Statistical significance was defined as a two-sided p-value < 0.05 .

Ethical Approval

The study was approved by the University of Health Sciences Türkiye, Ankara Bilkent City Hospital Clinical Research Ethics Committee (approval no: TABED 1-26-2584; date: 22 April 2026) and was conducted in accordance with the principles of the Declaration of Helsinki. Written informed consent was obtained from all participants included in the study.

RESULTS

A total of 127 eligible pregnant women were initially enrolled in the study. After exclusion of 24 women (8 who delivered at another hospital and 16 who met one or more predefined exclusion criteria), 103 postpartum women were included in the final analysis. Participant selection and study flow are summarized in Figure 1.

Of the 103 participants, 44 (42.7%) received regular breastfeeding counseling, whereas 59 (57.3%) did not. The demographic and obstetric characteristics of the participants are presented in Table 1. No significant differences were observed between the groups regarding maternal age (31.84 ± 4.03 vs. 30.58 ± 4.02 years, respectively; $p = 0.118$) or gestational age at delivery (37.85 ± 1.86 vs. 38.44 ± 1.66 weeks; $p = 0.344$). Similarly, birth weights were comparable between the groups (3310 ± 250 g vs. 3231 ± 437 g; $p = 0.296$). The distribution of infant sex also did not differ significantly between the groups ($p = 0.771$). However, significant differences were identified with respect to educational status and employment status. Mothers who received regular breastfeeding counseling had higher educational attainment and were more frequently actively employed compared with those who did not receive counseling ($p = 0.021$ and $p = 0.014$, respectively). In contrast, perceived income level, smoking status, planned pregnancy, and neonatal hospitalization history were comparable between the groups (all $p > 0.05$). The most commonly reported postpartum complaints included breastfeeding-related problems, pain, and suture-related discomfort. Breastfeeding problems were reported significantly more frequently among mothers who did not receive regular breastfeeding counseling ($p < 0.001$).

Total MIBS scores and individual item scores are presented in Table 2. Mothers who did not receive regular breastfeeding counseling had significantly higher total MIBS scores compared with those who received counseling (6.39 ± 2.43 vs. 2.30 ± 2.15 , respectively; $p < 0.001$).

Exploratory analysis of individual MIBS items demonstrated that mothers receiving regular breastfeeding counseling had significantly lower scores in items assessing loving feelings, anger, neutral feelings, joyfulness, disappointment, and irritability (all $p < 0.01$). In

Table 1. Comparison of demographic and clinical characteristics according to regular breastfeeding counseling status.

Variable	Regular counseling (n = 44)	No regular counseling (n = 59)	p
Age (years)	31.84 ± 4.03	30.58 ± 4.02	0.118
Parity	1.77 ± 0.80	2.20 ± 1.11	0.024
Gestational week	37.85 ± 1.86	38.44 ± 1.66	0.344
Birth weight (g)	3310 ± 250	3231 ± 437	0.296
Female infant sex	23 (52.3%)	33 (55.9%)	0.771
Smoking	4 (9.1%)	6 (10.2%)	0.385
Planned pregnancy	35 (79.5%)	45 (76.3%)	0.462
Neonatal hospitalization	8 (18.2%)	11 (18.6%)	0.892
Educational status			0.021
Primary school	1 (2.3%)	1 (1.7%)	
Secondary school	1 (2.3%)	8 (13.6%)	
High school	8 (18.2%)	18 (30.5%)	
University	25 (56.8%)	29 (49.2%)	
Master's degree	9 (20.5%)	3 (5.1%)	
Employment status			0.014
Unemployed	22 (50.0%)	47 (79.7%)	
Employed	21 (47.7%)	12 (20.3%)	
Other	1 (2.3%)	0 (0.0%)	
Income perception			0.512
Income lower than expenses	1 (2.3%)	3 (5.1%)	
Income equal to expenses	32 (72.7%)	42 (71.2%)	
Income higher than expenses	11 (25.0%)	14 (23.7%)	
Most common postpartum complaint			
Breastfeeding problems	14 (31.8%)	52 (88.1%)	<0.001
Pain	15 (34.1%)	6 (10.2%)	<0.001
Suture-related complaints	12 (27.3%)	0 (0.0%)	<0.001

Data are presented as mean ± standard deviation or n (%). Participants were allowed to select more than one postpartum complaint.

contrast, no significant between-group differences were observed for the items related to dislike and protectiveness.

In multivariable linear regression analysis (Table 3), regular breastfeeding counseling remained independently associated with lower total MIBS scores [$\beta = -4.51$, 95% confidence interval (CI): -5.43 to -3.58; $p < 0.001$].

Employment status was also independently associated with total MIBS scores ($\beta = 1.30$, 95% CI: 0.29-2.32; $p = 0.012$). In contrast, maternal age, parity, educational status, planned pregnancy, and smoking status were not significantly associated with total MIBS scores. Figure 2 presents the distribution of total MIBS scores according to study groups using boxplot analysis. Mothers who received regular breastfeeding counseling demonstrated lower median MIBS scores and a more homogeneous score distribution.

Table 2. Comparison of MIBS scores according to regular breastfeeding counseling status.

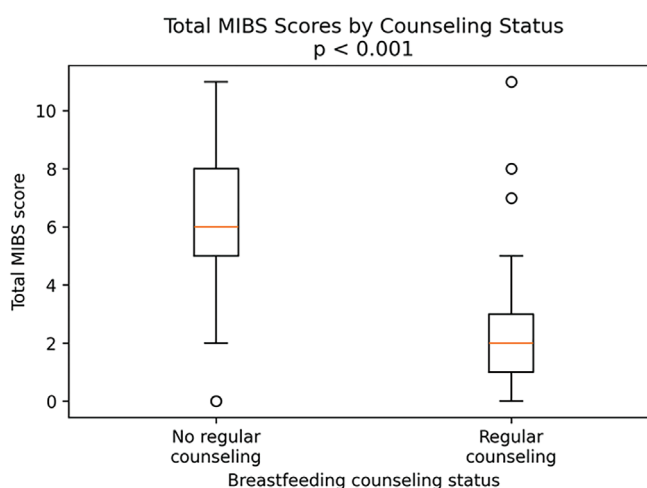
Score	No regular counseling	Regular counseling	p
Total MIBS score	6.39 ± 2.43	2.30 ± 2.15	<0.001
MIBS item 1 (Loving)	0.73 ± 0.52	0.11 ± 0.32	<0.001
MIBS item 2 (Angry)	0.97 ± 0.59	0.45 ± 0.50	<0.001
MIBS item 3 (Neutral)	0.73 ± 0.45	0.18 ± 0.45	<0.001
MIBS item 4 (Joyful)	0.69 ± 0.77	0.32 ± 0.52	0.004
MIBS item 5 (Dislike)	0.17 ± 0.50	0.05 ± 0.30	0.120
MIBS item 6 (Protective)	0.15 ± 0.48	0.14 ± 0.35	0.844
MIBS item 7 (Disappointment)	1.31 ± 0.68	0.41 ± 0.73	<0.001
MIBS item 8 (Irritable)	1.66 ± 0.82	0.66 ± 0.64	<0.001

Data are presented as mean ± standard deviation. Individual item analyses were exploratory. MIBS: Mother-to-infant bonding scale.

Table 3. Multivariable linear regression analysis of independent variables associated with total MIBS score.

Variable	B	95% CI	p
Regular breastfeeding counseling	-4.51	-5.43 to -3.58	<0.001
Age	0.03	-0.09 to 0.15	0.590
Parity	0.16	-0.38 to 0.69	0.567
Educational status	-0.12	-0.73 to 0.49	0.700
Employment status	1.30	0.29 to 2.32	0.012
Planned pregnancy	-0.46	-1.49 to 0.57	0.375
Smoking	0.19	-1.26 to 1.65	0.792

Model: $R^2 = 0.527$, adjusted $R^2 = 0.492$, model $p < 0.001$. CI: Confidence interval, MIBS: Mother-to-infant bonding scale.

**Figure 2.** Boxplot distribution of total mother-to-infant bonding scale (MIBS) scores according to regular breastfeeding counseling status. Mothers who received regular breastfeeding counseling demonstrated lower median MIBS scores compared with mothers who did not receive counseling ($p < 0.001$). Lower MIBS scores indicate more favorable maternal-infant bonding.

DISCUSSION

The principal finding of the present study is that regular postpartum breastfeeding counseling was associated with significantly lower MIBS scores, suggesting more favorable maternal-infant bonding during the second postpartum month. Given that lower MIBS scores reflect stronger maternal bonding, these findings are consistent with more favorable maternal-infant bonding and suggest that regular breastfeeding counseling may be associated not only with breastfeeding practices but also with the emotional relationship established between the mother and her infant. However, given the observational design, these findings should be interpreted as an association rather than as evidence of a causal effect.

One of the methodological strengths of this study is the use of multivariable linear regression analysis. Even after adjustment for potential confounding variables including maternal age, parity, educational status, employment status, planned pregnancy, and smoking status, regular breastfeeding counseling remained independently associated with lower total MIBS scores. Nevertheless, the observational design also raises the possibility of reverse causation. Mothers with greater motivation, stronger early maternal attachment, or higher engagement with healthcare services may have been more likely to participate in regular breastfeeding counseling. Consequently, the observed association may partially reflect baseline participant characteristics rather than the counseling intervention alone.

Breastfeeding-related difficulties are known to contribute to maternal stress, anxiety, and feelings of inadequacy. The breastfeeding self-efficacy model proposed by Dennis (12) demonstrated that breastfeeding success is closely associated with maternal psychological confidence and emotional adjustment. Similarly, Qi et al. (6) reported that parenting self-efficacy mediates the relationship between postpartum depression and maternal bonding. In our cohort, breastfeeding-related problems were substantially more frequent among mothers who did not receive regular counseling (88.1% vs. 31.8%), supporting the hypothesis that breastfeeding counseling may be associated with benefits extending beyond technical education by enhancing maternal confidence and reducing emotional distress during the postpartum period.

Recent interventional studies have further demonstrated the beneficial effects of professional breastfeeding support on breastfeeding behaviors and maternal adaptation. In a randomized controlled trial conducted by Sönmez et al. (13), hybrid breastfeeding counseling significantly improved maternal breastfeeding behaviors and breastfeeding success. Our findings are consistent with these observations and additionally suggest that regular counseling may be associated with more favorable maternal-infant bonding. Although individual MIBS items were analyzed descriptively to better characterize maternal emotional responses, the scale was originally developed as a global measure of maternal-infant bonding rather than as a set of independent psychometric subdomains. Therefore, findings related to individual items should be regarded as exploratory and interpreted cautiously. Furthermore, the study by Daglar and Nur (14) demonstrated that social support, maternal emotional status, and postpartum psychological adjustment are closely associated with maternal-infant bonding, further supporting the psychosocial framework underlying our findings.

The influence of childbirth experience on postpartum psychological adaptation should also be considered. Severe postpartum pain and negative childbirth experiences have been associated with an increased risk of postpartum depression and impaired maternal emotional adjustment (7,8). In the Cochrane review by Bohren et al. (9), continuous professional support during childbirth was shown to improve maternal satisfaction and positively influence the overall birth experience. In this context, sustained breastfeeding counseling during the postpartum period may function as an important supportive mechanism by reducing emotional stress and facilitating maternal adaptation to infant care with greater confidence and emotional stability.

Another noteworthy finding of the present study was the independent association between employment status and total MIBS scores. Mothers who received regular breastfeeding counseling also had higher educational attainment and employment rates, suggesting that this group may initially have had a more advantageous profile with respect to healthcare access, health literacy, and postpartum self-management skills. Therefore, the observed association with maternal-infant bonding may not be attributable solely to breastfeeding counseling itself. Although several sociodemographic variables were adjusted for in the multivariable regression analysis, residual confounding and unmeasured psychosocial factors cannot be entirely excluded. Mothers receiving regular counseling may have differed from those who did not in terms of health literacy, healthcare utilization, motivation, family support, and psychosocial resources, all of which may influence both counseling participation and maternal-infant bonding outcomes.

Despite these limitations, structured breastfeeding counseling represents a practical and easily implementable component of routine postpartum care. Because breastfeeding counseling is already incorporated into many maternity care settings, optimizing and standardizing counseling delivery may represent a realistic strategy for strengthening postpartum support. If confirmed in prospective randomized studies, integrating standardized breastfeeding counseling into postpartum follow-up programs may contribute to maternal psychosocial well-being and maternal-infant bonding. Future multicenter prospective studies with randomized designs and comprehensive assessment of psychosocial and breastfeeding-related factors are warranted to clarify the causal relationship between breastfeeding counseling and maternal-infant bonding.

Study Limitations

First, because of its observational cross-sectional design, causality cannot be inferred, and the findings should be interpreted as demonstrating an association rather than a causal effect. Second, participation in the breastfeeding counseling program was not randomized, introducing the possibility of self-selection bias and reverse causation. Mothers receiving counseling had higher educational attainment and employment rates, which may reflect differences in health literacy, healthcare utilization, and psychosocial resources. Although multivariable regression analysis was performed, residual confounding cannot be completely excluded. Third, several potentially important psychosocial and breastfeeding-related variables, including breastfeeding exclusivity and duration, maternal anxiety, perceived social support, sleep quality, family

environment, breastfeeding motivation, infant temperament, maternal fatigue, and quality of the marital relationship, were not systematically collected and therefore could not be included in the multivariable analysis. Fourth, although women with clinically diagnosed postpartum depression were excluded, no standardized screening instrument such as the Edinburgh postnatal depression scale was administered; consequently, undiagnosed or subclinical depressive symptoms may have remained unrecognized (4-6,15). In addition, pregnancy-related anxiety and prenatal attachment, which may be affected by obstetric complications such as preeclampsia and gestational diabetes mellitus, were not assessed; these unmeasured factors could also influence maternal-infant bonding (16). Furthermore, although the counseling protocol was standardized with respect to counselor, educational content, session frequency, and duration, educational interventions are inherently influenced by participant-related factors, including educational attainment, health literacy, motivation, and psychosocial characteristics. Accordingly, individual variability in response to counseling cannot be completely eliminated. Finally, maternal-infant bonding was assessed using a self-report instrument without observer-based confirmation, and the single-center design may limit the generalizability of the findings.

CONCLUSION

Regular postpartum breastfeeding counseling was independently associated with more favorable maternal-infant bonding during the second postpartum month. Given the observational design of the present study, these findings should be interpreted as demonstrating an association rather than a causal relationship. Structured breastfeeding counseling may represent a practical component of routine postpartum care and could contribute to maternal well-being when incorporated into comprehensive postpartum support programs. However, prospective multicenter studies, ideally incorporating randomized designs and comprehensive assessment of psychosocial and breastfeeding-related factors, are needed to confirm these findings and clarify whether the observed association reflects a causal relationship.

Ethics

Ethics Committee Approval: The study was approved by the University of Health Sciences Türkiye, Ankara Bilkent City Hospital Clinical Research Ethics Committee (approval no: TABED 1-26-2584; date: 22 April 2026) and was conducted in accordance with the principles of the Declaration of Helsinki.

Informed Consent: Written informed consent was obtained from all participants included in the study.

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For transparency, the authors note that an artificial intelligence-assisted language model (ChatGPT, OpenAI) was utilized to support text editing and language correction. This assistance was limited to linguistic refinement; all scientific content, critical analysis, and final editorial decisions were made exclusively by the authors.

Footnotes

Authorship Contributions

Concept: Z.K., A.B., Design: Z.K., A.B., Data Collection or Processing: Z.K., A.B., Analysis or Interpretation: Z.K., A.B., Literature Search: Z.K., A.B., Writing: Z.K., A.B.

Conflict of Interest: No conflict of interest was declared by the authors.

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